

CLAIMS

What is claimed:

- 1 1. A spectral correlator, comprising:
 - 2 a specimen;
 - 3 an optical device configured to collect light from the specimen and to
 - 4 optically determine a similarity of a received first spectra of the light collected
 - 5 from the first spectra and a second known spectra.
- 1 2. The spectral correlator of claim 1, wherein the optical device is further
- 2 configured to output a signal indicative of the similarity.
- 1 3. The spectral correlator of claim 2, further comprising a detection
- 2 device configured to sense the similarity signal and determine, based upon the
- 3 similarity signal, whether a substance, represented by the second known
- 4 spectra, is present in the specimen.
- 1 4. The spectral correlator of claim 3, wherein the optical device comprises
- 2 a first lens configured to perform a Fourier transform on the received first
- 3 spectra.
- 1 5. The spectral correlator of claim 4, further comprising a spatial filter
- 2 containing the Fourier transform of the second known spectra.

1 6. The spectral correlator of claim 5, wherein the first lens transmits a
2 signal indicative of the Fourier transform of the received first spectra to the
3 spatial filter.

1 7. The spectral correlator of claim 6, further comprising a second lens
2 configured to receive a second signal from the spatial filter and transmit a
3 signal indicative of the similarity of the received first spectra and the known
4 spectra onto the detection device.

1 8. The spectral correlator of claim 7, wherein the specimen is in direct
2 proximity to the optical device.

1 9. The spectral correlator of claim 7, wherein the specimen is remote from
2 the optical device.

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2 10. The spectral correlator of claim 9, wherein a variation with time of the
3 similarity signal is a representation of the variation as a function of distance of a
4 concentration of the specimen indicated by the second known spectra.

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6 11. The spectral correlator of claim 4, further comprising a spatial filter,
7 wherein the spatial filter contains a representation of the second known
8 spectra.

1 12. The spectral correlator of claim 11, wherein the first lens transmits a
2 signal indicative of the Fourier transform of the received first spectra to the
3 spatial filter.

1 13. The spectral correlator of claim 12, wherein the optical device further
2 comprises a second lens configured to receive a second signal from the spatial
3 filter indicative of the first signal and the representation of the known spectra.

1 14. The spectral correlator of claim 13, wherein the second lens is
2 configured to focus the received second signal and transmit a signal indicative
3 of the similarity of the received first spectra and the known spectra onto a
4 detection device.

1 15. The spectral correlator of claim 14, wherein the specimen is in direct
2 proximity to the correlator.

1 16. The spectral correlator of claim 14, wherein the specimen is remote
2 from the optical device.

1 17. The spectral correlator of claim 16, wherein the variation with time of
2 the similarity signal is a representation of the variation as a function of distance
3 of the concentration of the specimen indicated by the second known spectra.

1 18. A spectral correlator, comprising:
2 a specimen;
3 an illuminating device configured to illuminate the specimen; and
4 an optical device configured to optically determine the similarity of a
5 received first spectra resulting from the illumination of the specimen and a
6 second known spectra.

1 19. The spectral correlator of claim 18, wherein the optical device is
2 further configured to output a signal indicative of the similarity.

1 20. The spectral correlator of claim 19, further comprising a detection
2 device configured to sense similarity signal and determine, based upon the
3 similarity signal, whether a substance, represented by the second known
4 spectra, is present in the specimen.

1 21. The spectral correlator of claim 20, wherein the optical device
2 comprises a first lens configured to perform a Fourier transform on the
3 received first spectra.

1 22. The spectral correlator of claim 21, further comprising a spatial filter,
2 wherein the spatial filter contains the Fourier transform of the second known
3 spectra.

1 23. The spectral correlator of claim 22, wherein the first lens transmits a
2 signal indicative of the Fourier transform of the received first spectra to the
3 spatial filter.

1 24. The spectral correlator of claim 23, wherein the optical device further
2 comprises a second lens configured to receive a second signal from the spatial
3 filter indicative of the first signal and the Fourier transform of the known
4 spectra.

1 25. The spectral correlator of claim 24, wherein the second lens is
2 configured to focus the received second signal and transmit a signal indicative
3 of the similarity of the received first spectra and the known spectra onto a
4 detection device.

1 26. A spectral correlator of claim 25, wherein the received first spectra is a
2 Raman spectra resulting from the illuminating device illuminating the
3 specimen and the second spectra is a known Raman spectra.

1 27. A spectral correlator of claim 26, wherein the received first spectra is a
2 Raman spectra resulting from the illuminating device illuminating the
3 specimen and the second spectra is a known Raman spectra.

1 28. The spectral correlator of claim 21, wherein the spatial filter contains a
2 representation of the second known spectra.

1 29. The spectral correlator of claim 28, wherein the first lens transmits a
2 signal indicative of the Fourier transform of the received first spectra to the
3 spatial filter.

1 30. The spectral correlator of claim 29, wherein the optical device further
2 comprises a second lens configured to receive a second signal from the spatial
3 filter indicative of the first signal and the representation of the known spectra.

1 31. The spectral correlator of claim 30, wherein the second lens is
2 configured to focus the received second signal and transmit a signal indicative
3 of the similarity of the received first spectra and the known spectra onto a
4 detection device.

1 32. A spectral correlator of claim 31, wherein the received first spectra is a
2 Raman spectra resulting from the illuminating device illuminating the
3 specimen and the second spectra is a known Raman spectra.

1 33. The spectral correlator of claim 32, wherein the variation with time of
2 the similarity signal is a representation of the variation as a function of
3 distance of the concentration of the specimen indicated by the second known
4 spectra.

1 34. A spectral correlator, comprising:
2 a specimen;
3 means for receiving light reflected off and/or emitted by the specimen;
4 and
5 means for optically correlating the light received to determine the
6 similarity of the spectra of the received light from the specimen and a second
7 known spectra.

1 35. A spectral correlation method, comprising the steps of:
2 receiving a first spectra corresponding to a specimen;
3 performing a first Fourier transform on the first spectra via a first lens
4 to obtain a transformed first spectra;
5 multiplying the transformed first spectra with a representation of a
6 known spectra to obtain a similarity signal; and
7 focusing, via a second lens, the similarity signal on a detector.

1 36. The method of claim 35, wherein the representation of the first spectra
2 is a Fourier transform of the known spectra.

1 37. The method of claim 35, wherein the performing step, the multiplying
2 step and the focusing step are optically performed via an optical device.

1 38. The method of claim 35, wherein the specimen is remotely located
2 from the optical device.

1 39. The method of claim 35, wherein the specimen is housed proximate to
2 the optical device.

1 40. The method of claim 35, wherein the first spectra is a Raman spectra,
2 and the known spectra is a Raman spectra.

1 41. The method of claim 40, wherein a variation with time of the similarity
2 signal is a representation of the variation as a function of distance of the
3 concentration of the specimen indicated by the known spectra.

1 42. A spectral correlation method, comprising the steps of:
2 receiving a first spectra corresponding to a specimen;
3 separating the first spectra into its component colors;
4 multiplying the separated first spectra with a representation of a known
5 second spectra to obtain a similarity signal; and
6 detecting the similarity signal.